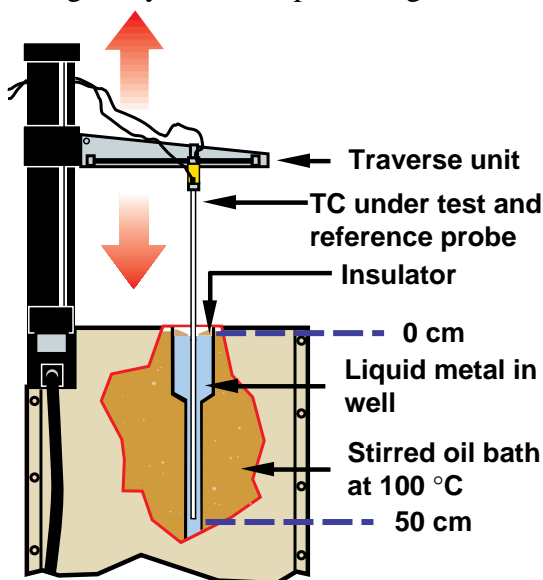


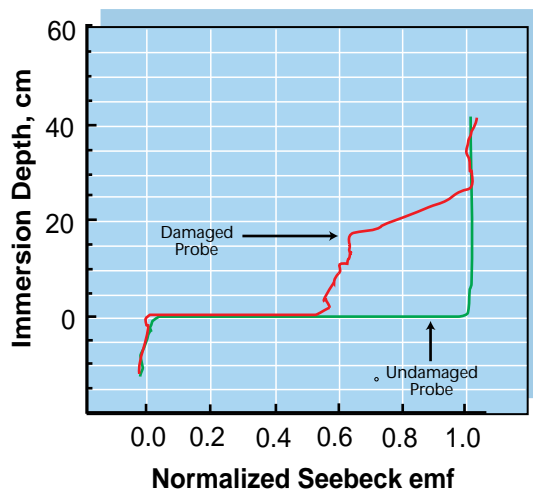
## Technology Opportunity

# Measuring Seebeck Inhomogeneity of Thermocouples

The measurement accuracy of a thermocouple is severely impacted if a significant inhomogeneity and a temperature gradient are



System for measuring the Seebeck inhomogeneity of sheathed thermocouples



Platinum sheathed type R thermocouple with 20 cm insertion into an 1100 °C furnace with stainless steel exposure for 16 hours

present in the same region of the probe. The Seebeck inhomogeneity is an abnormal variation of the Seebeck coefficient from point to point in the thermocouple material and is not disclosed in conventional calibration. An apparatus has been developed that measures the Seebeck inhomogeneity of a sheathed thermocouple probe and expresses the results as a measured quantity.

## Potential Commercial Uses

- Thermocouple manufacturers - Quality assurance requires knowledge of inhomogeneity
- Calibration laboratories - Evaluating inhomogeneity is a necessary step in calibration
- Research laboratories and industrial plants - In-house quality assurance and calibration departments, especially where thermocouples are used in harsh environments, at high temperatures, or for long durations.

## Benefits

- Ability to calibrate to a definite accuracy
- Ability to make uncertainty analysis
- Ability to assess damage to probes
- The study of thermoelectric thermometry



## The Technology

The extent to which an inhomogeneous thermocouple probe produces an error is dependent upon the variation in the Seebeck coefficient and the temperature gradient along the probe. Seebeck inhomogeneity is not disclosed in conventional calibrations.

With this apparatus, the Seebeck coefficient of each segment along the probe is measured by passing the probe, step-by-step, through a narrow, well-defined temperature differential. One end of the probe is maintained at room temperature with forced air, and the other end of the probe is heated by inserting it into a bath of liquid metal at 100°C. Thus, the measured emf is contributed to the segment of the probe that is at that time being subjected to the temperature step.

## Options for Commercialization

NASA seeks industry partners to cooperatively develop commercial products based on measuring the Seebeck Inhomogeneity of thermocouples. This technology is protected by Langley patent applications.

This commercial opportunity is part of the NASA Technology Program. The objective of this program is to proactively involve the private sector in NASA's programs to ensure that the technology developed will have maximum commercial impact.

### *Contact*

If your company is interested in the Seebeck Inhomogeneity Measurement technology, or if you desire additional information, please contact:

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### *Key Words*

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